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Small Teaching: From Minor Changes to Major Learning

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FROM MINOR CHANGES TO MAJOR LEARNING

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The Power of Small Changes

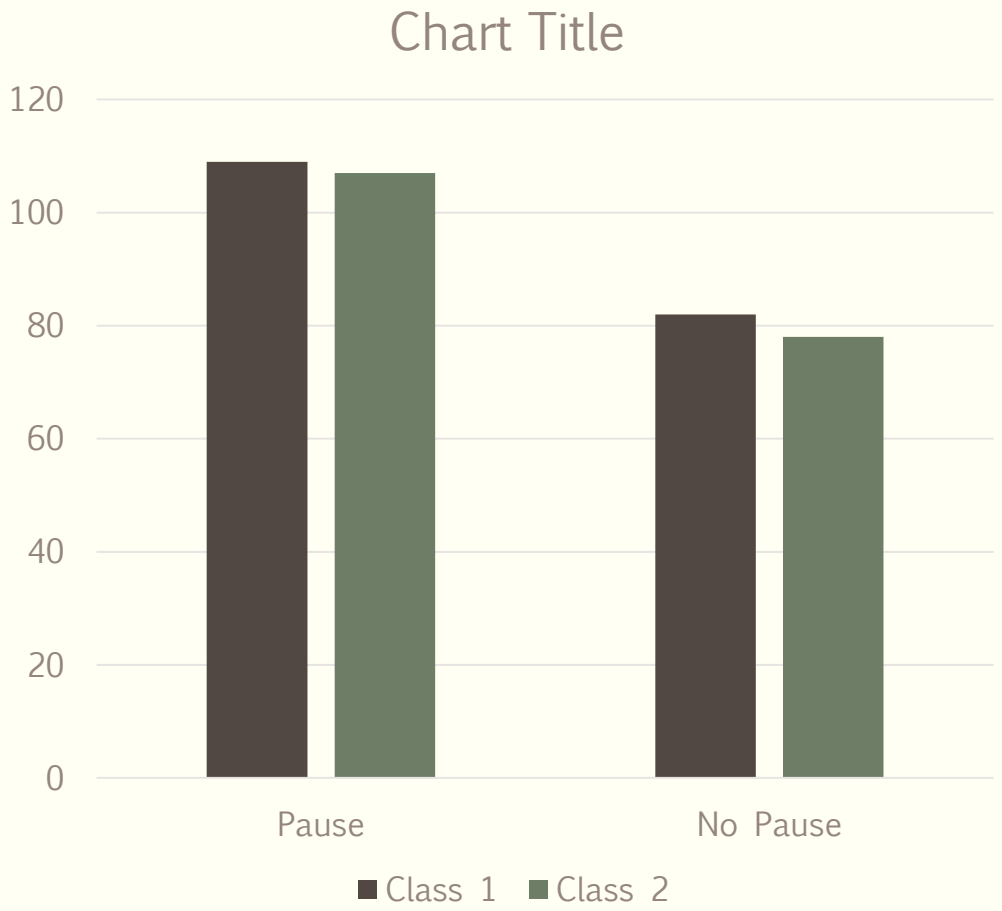
"Much of what we've been doing as teachers and students isn't serving us well, but some comparatively simple changes could make a big difference."

Brown, Roediger, McDaniel

Make it Stick (Harvard UP, 2014)

Pausing for Learning

- "In the current study the procedure consisted of pausing for 2 minutes 3 times during each 45-minute lecture. During the pause, subjects formed dyads and discussed lecture content (e.g., asked each other for clarification of concepts or caught up on notes). No instructor-subject interaction occurred during the pauses."



Small Teaching Innovations

- **Brief** (5-15 minute) interventions into individual learning sessions
- **Limited** number of interventions or activities within an entire course
- **Minor** changes to course design, assessment structure, or communication with students

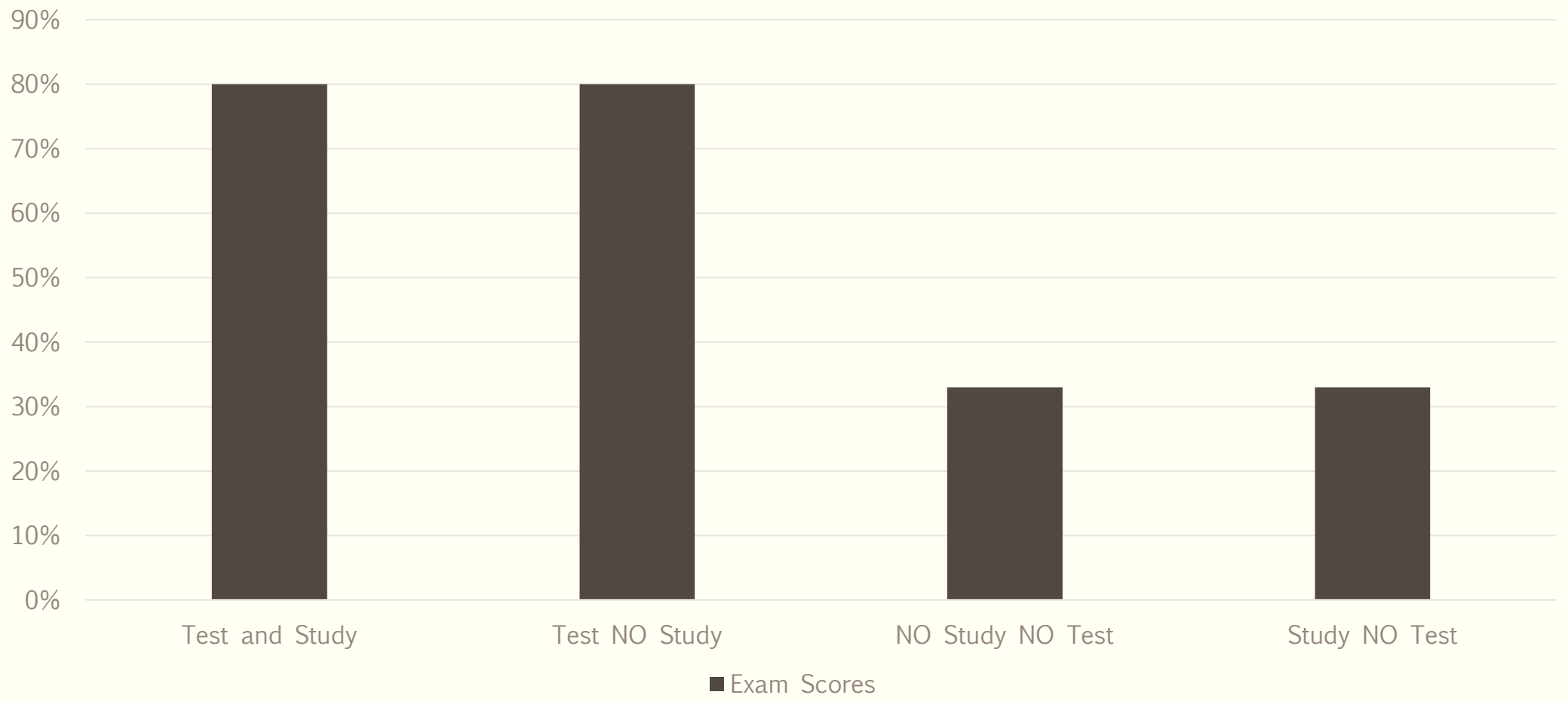
FOUNDATIONAL KNOWLEDGE

Knowledge: "The Hidden Power" of Cognition

- "Skills grow organically out of specific knowledge domains—that is to say, facts . . . The wider your knowledge, the more widely your intelligence can range and the more purchase it gets on new information."

  Ian Leslie, *Curious*

Retrieval Practice in the Laboratory



Limits of Long-Term Memory

- "In long-term-memory the limiting factor is not storage capacity, but rather the ability to find what you need when you need it. Long-term memory is rather like having a vast amount of closet space—it is easy to store many items, but it is difficult to retrieve the needed item in a timely fashion."

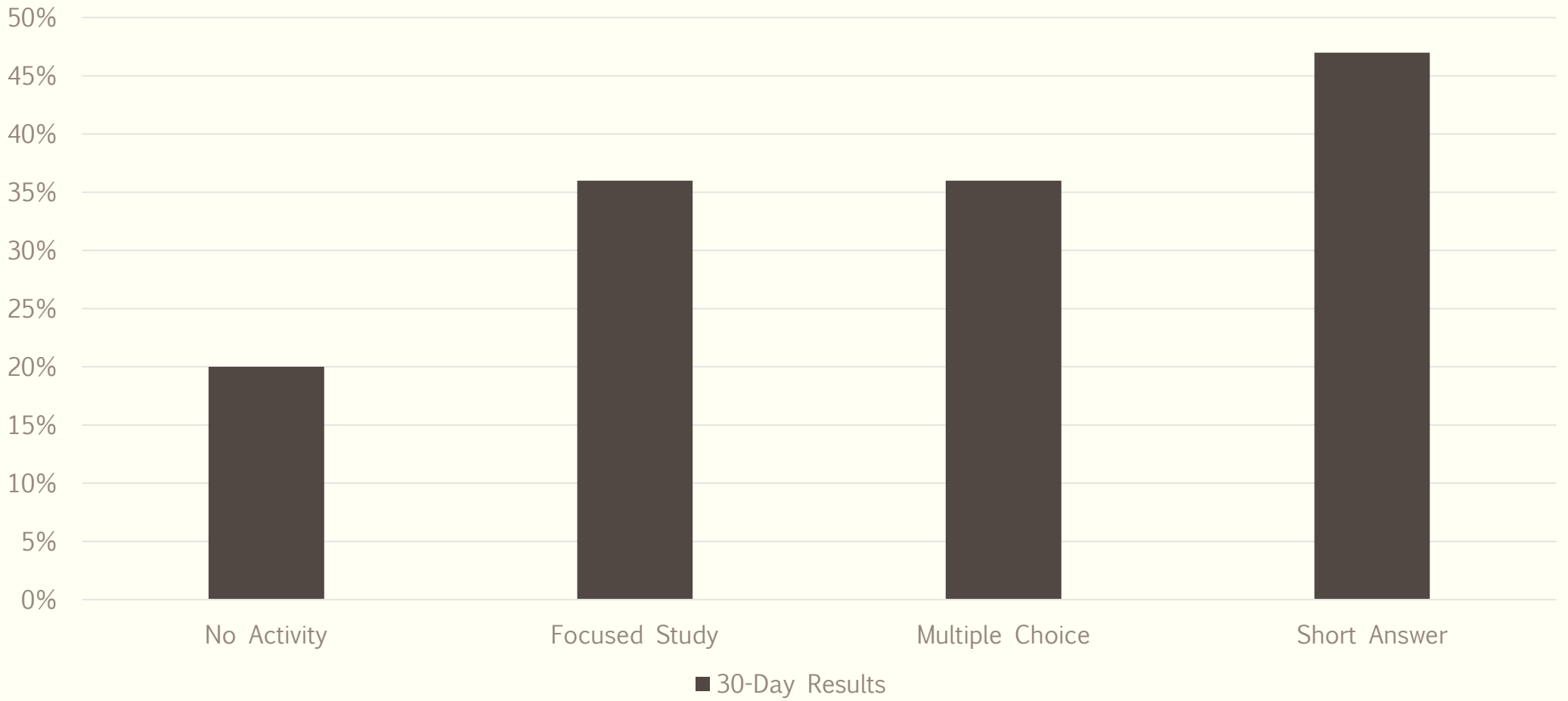
Michelle Miller

A Little Bit of Theory . . .

- "Memories . . . are encoded by modifications in the strengths of connections among neurons. When we experience an event or acquire a new fact, complex chemical changes occur at the junctions—synapses—that connect neurons with one another . . . with the passage of time, these modifications can dissipate . . . **unless strengthened by subsequent retrieval and recounting**."

Daniel Schacter

Thinking to Retrieve



Retrieval as a Form of Thinking

- “By retrieving a memory we modify, reorganize, and consolidate it better in our long-term storage. Furthermore, recalling a memory often creates additional retrieval pathways to that memory, and makes it easier to find it later. Lastly, by searching for a memory, we frequently activate information connected to that memory and link it in a more networked context for easier future access.”

Tricia Taylor

The Learning Scientists

Small Teaching: Retrieval

- Open class by asking students to *"remind" you of previous content or summarize readings.*
- Close class by . . . asking students to *write down the most important concept from that day* (i.e., the minute paper) and *one remaining question*.
- *Use polling with peer instruction intervals* in order to allow students to help one another retrieve, think, and engage.

Which learning strategy did the researchers find as most effective for students?

Summary of Learning Strategies (2013)

Low Utility

- Summarization
- Highlighting
- Re-reading
- Keyword Mnemonics
- Imagery

Moderate to High Utility

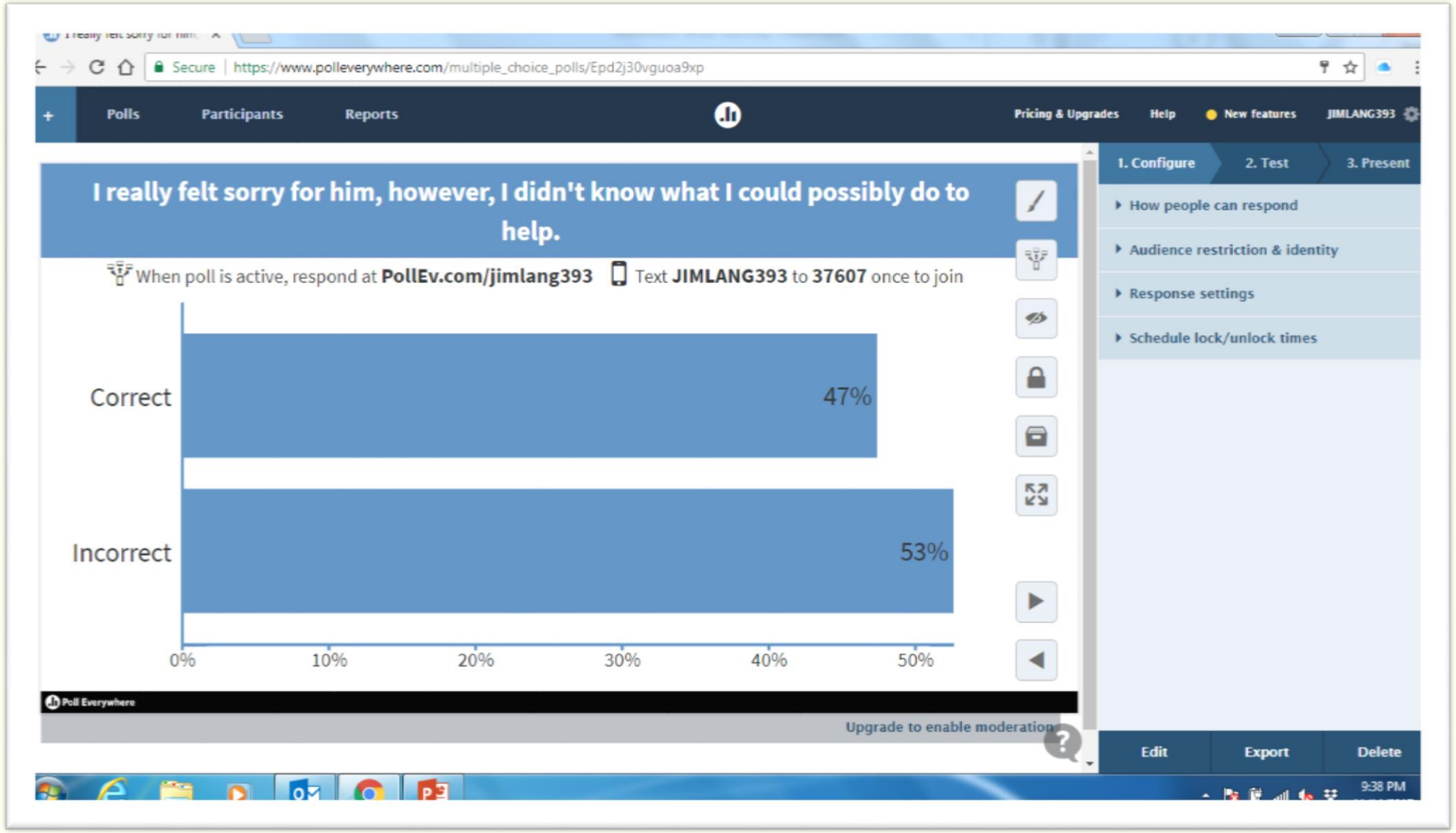
- Elaborative Interrogation
- Interleaved Practice
- Self-Explanation

- **Distributed Practice**
- **Practice Testing**

Peer Instruction: Retrieval+Thinking+Engagement

- Instructor poses a question or problem.
- Students work on question or problem individually and post response.
- **Students turn to their neighbor and explain their response.**
- Students re-submit their answers.
- Instructor solicits explanations from students.
- Instructor provides correct answer or solution.

Conceptual Understanding



CONNECTING

Connected Knowledge

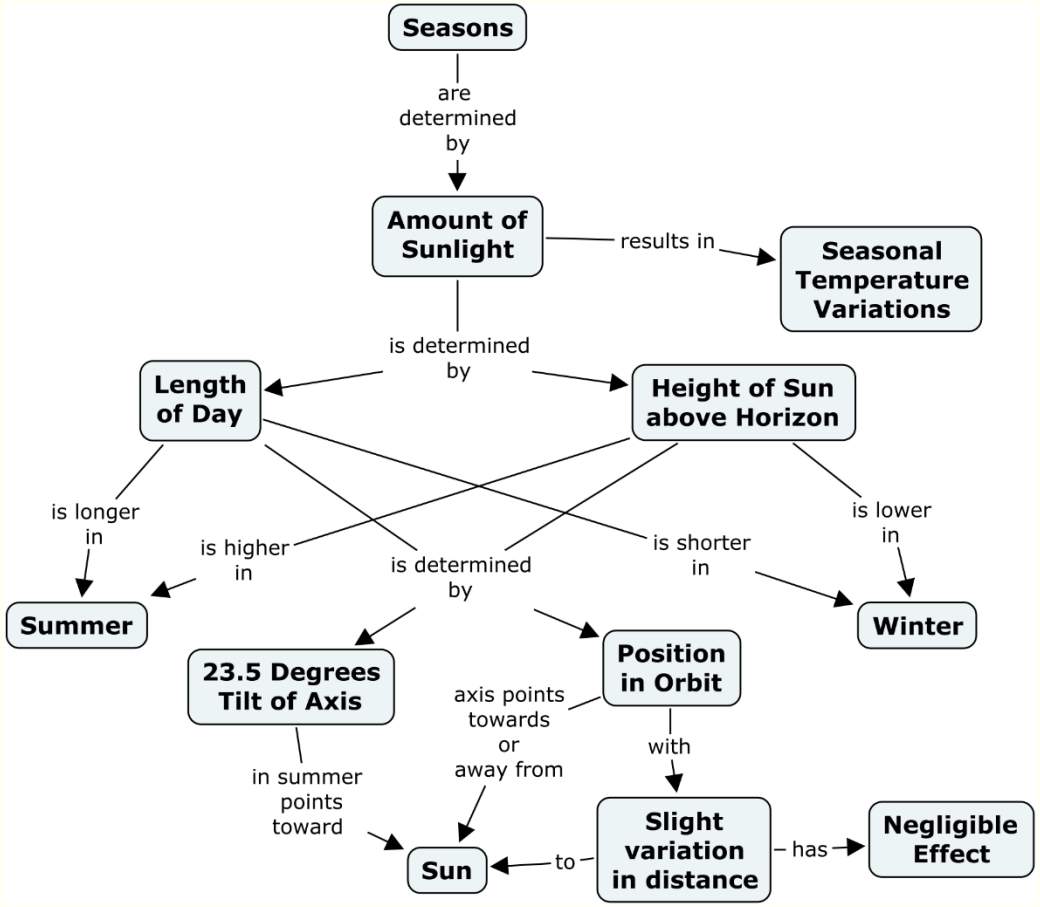
"One important way experts' and novices' knowledge organizations differ is **the number or density of connections among the concepts, facts, and skills they know** . . . as experts in our domain, we may organize our knowledge in a way that is quite different from how our students organize theirs."

How Learning Works

Connection Questions

- List one way in which the day's course content manifests itself on campus or in their home lives.
- Identify a television show, film, or book that somehow illustrates a course concept from class.
- Describe how today's material connects to last week's.
- Explain how that day's material connects to something they learned in another course.
- How would you connect today's material to any current political/economic/social debate we are having?

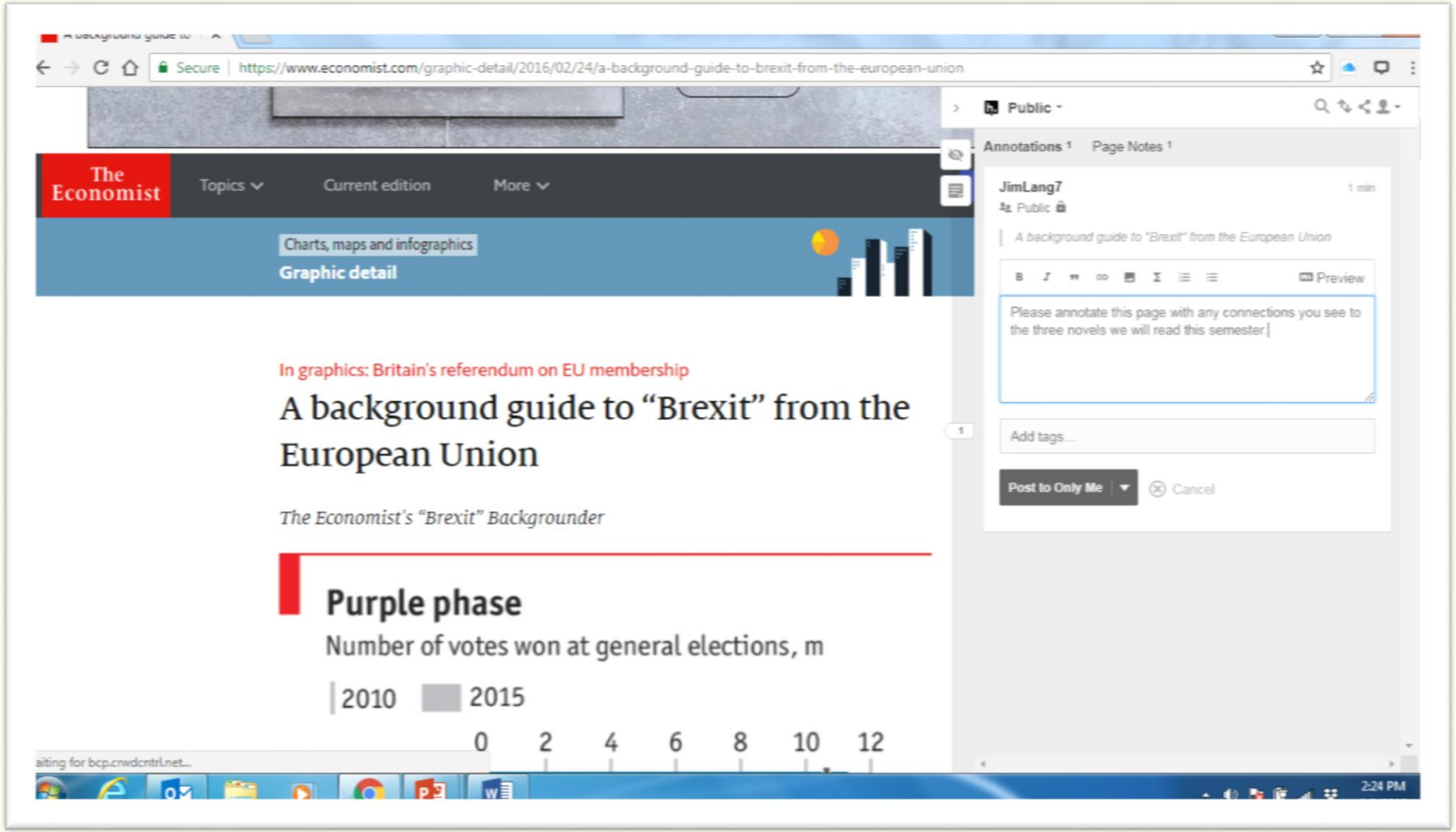
Concept Maps



- A meta-analysis of 55 studies found that **students who completed concept maps on a topic had higher levels of knowledge retention and transfer** compared to students who read passages of text, attended lectures, or participated in classroom discussions on the topic (Nesbit & Adesope 2006)."

ABL Connect

Connection through Annotation



Someone Give Me . . .

- An Analogy: What's It Like?
- An Example: Where Have You Seen It?
- A Reason: Why Does It Matter?

Well-Wrought Learning

- “You now see why ‘cramming’ must be so poor a mode of study. Cramming seeks to stamp things in by intense application immediately before the ordeal. But a thing thus learned **can form but few associations**. On the other hand, the same thing recurring on different days, in different contexts, read, recited on, referred to again and again, **related to other things** and reviewed, gets well wrought into the mental structure.”

William James (1899)

Small Teaching: Connections

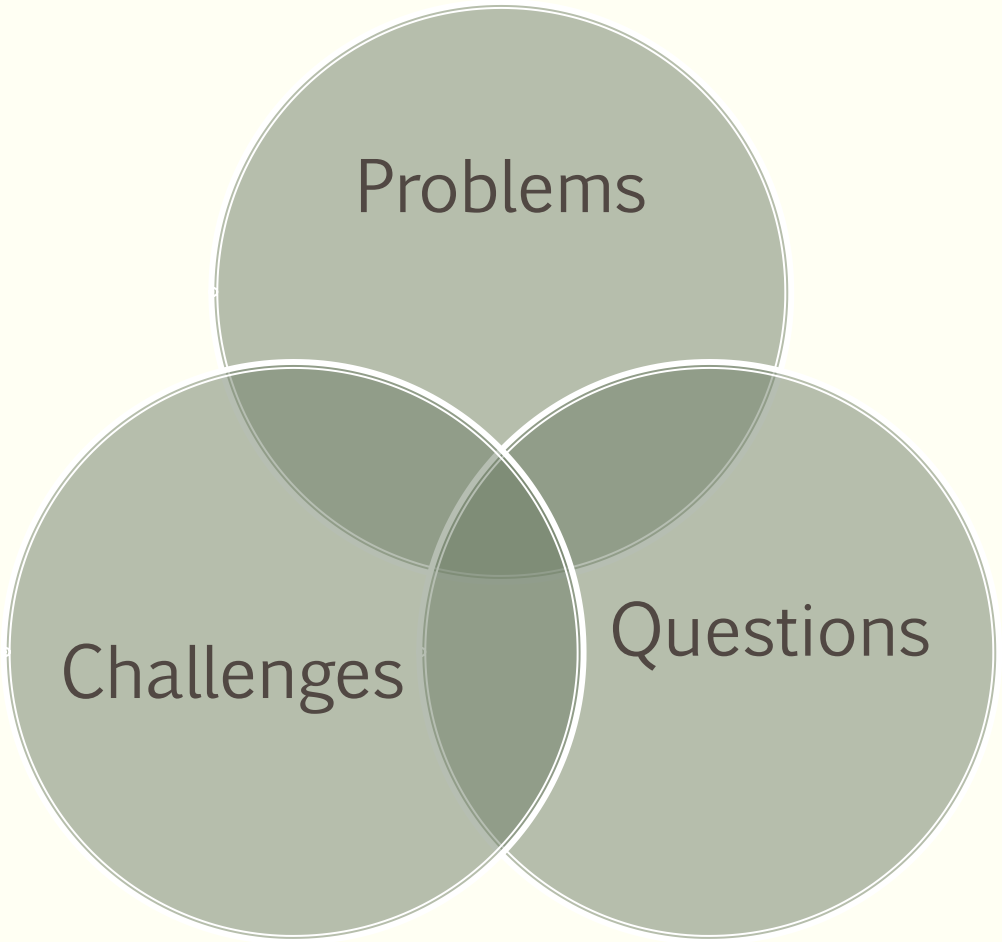
- *Consider using connection notebooks or discussions* to help students connect course material to their lives.
- Require students to *create concept maps multiple times* or *with different organizational principles.*
- *Use annotation tools like Hypothes.is or Perusall* to create connecting threads on course texts.
- Think continually about how to *invite students to create their own examples and connections.*

MOTIVATION

A Box of Content

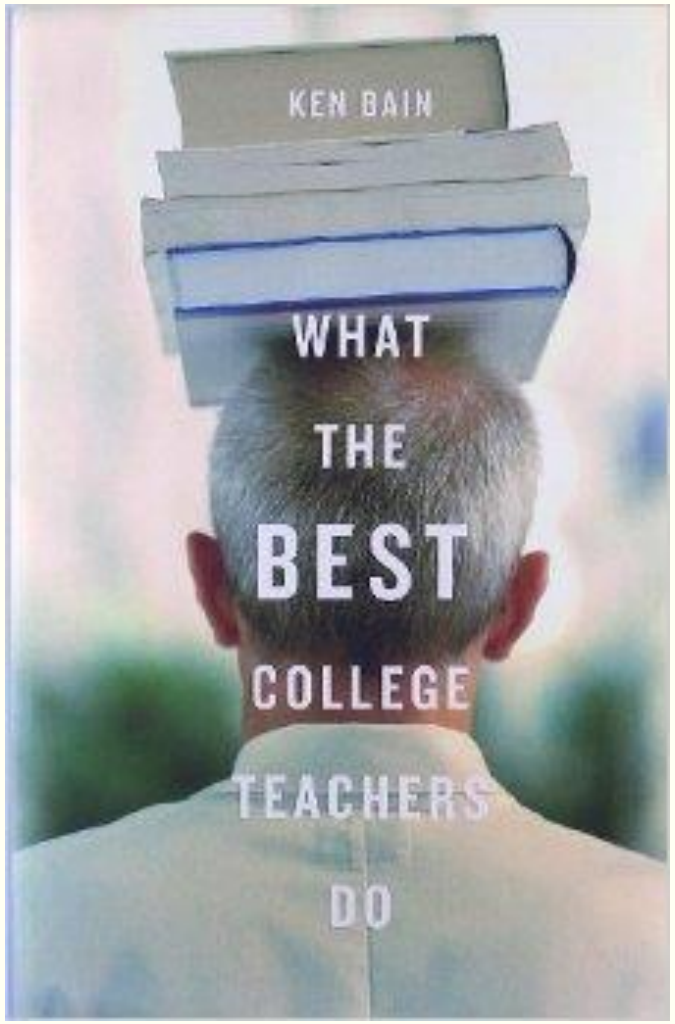
The focus of this course is on nutrient uptake and translocation, nutrient deficiency symptoms, plant primary and secondary metabolism, physiological responses to biotic and abiotic stresses, hormones and signal transduction, defense and immune responses. The laboratory component of this course will provide opportunity for students to have hands on experience and assess plants physiological behavior by determining metabolites content and enzymes activities and studying hormones and nutrients.

What the Best Teachers Do



Building a Learning Experience

- 1. Articulate Problem or Question
- 2. Explain Significance or Relevance
- 3. Give Students Opportunity to Answer
- 4. Provide Answer
- 5. Conclude with Problem or Question



Motivating Learners

- *Build courses, units, and individual class periods* around problems, questions, or challenges.
- Build *purpose or question reminders* into assignment sheets or other regular communication with students.
- Use opening and closing minutes of class to *invite students into thinking about purpose and meaning.*

More Information and Resources . . .

- "Small Changes in Teaching"
- RetrievalPractice.org
- *How Learning Works*
- Best Teachers Summer Institute
- @LangOnCourse